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THE RELATION OF THE FORT SCOTT FORMATION TO THE BOONE CHERT IN SOUTHEASTERN KANSAS AND NORTHEASTERN OKLAHOMA[1]

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The Fort Scott formation is a limestone with interbedded shales of the lower Pennsylvanian system in southeastern Kansas and northeastern Oklahoma. The outcrop of this formation extends from the region north and east of Fort Scott (T. 25 S., R. 25 E.), Kansas, southwestward to several miles south and east of Broken Arrow (T. 18 N., R. 14 E.), Oklahoma, where it is thin and too much covered for further mapping. The Boone chert (Osage series) of the Mississippian system is a hard, cherty limestone which outcrops in the extreme southeastern part of Kansas and the northeastern corner of Oklahoma. These two limestone horizons dip gently to the west and are separated in this area by the Cherokee formation. The Cherokee formation (Pennsylvanian) consists largely of shale with a few limestone and sandstone beds. Toward the southern edge of the area under discussion other formations appear between the Boone chert and the Fort Scott formation. They are known as the Mayes[2] limestone, the Fayetteville, the Pitkin, and the Morrow formations and consist largely of limestone with some shale. These affect only the area south of the territory discussed.

The map on page 619 shows a number of isobathic lines, or lines connecting points of equal intervals, between the top of the Fort Scott formation and the top of the Boone chert. These intervals were determined from measured geologic sections on the outcrop of the formations and from about five hundred records of wells which have been drilled to the Boone chert, west of the outcrop

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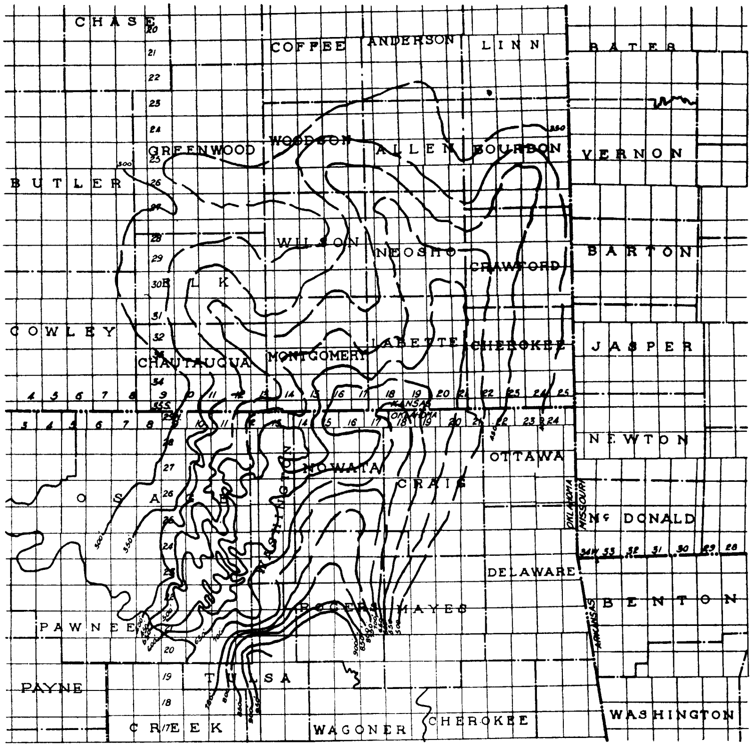
[1] Published by permission of the chief geologist, Empire Gas and Fuel Company.

[2] L. C. Snider, *Okla. Geol. Surv. Bulletin No. 24*, p. 27.



CONTOUR MAP SHOWING INTERVAL BETWEEN FT. SCOTT LIMESTONE and THE BOONE CHERT OF SOUTHEASTERN KANSAS AND NORTHEASTERN OKLAHOMA.

of the Fort Scott limestone. The records have been studied carefully and the top of the Fort Scott limestone determined by means of "spiderweb" cross-sections made from several thousand well records scattered uniformly from the locality of the outcrop on the east, westward past the edge of the area.

The interval between the Boone chert and the Fort Scott limestone, i.e., the thickness of the Cherokee shale and Fort Scott limestones, at their outcrop near Pryor Creek, Oklahoma, has been determined as being 500 feet. This is considerably less than has been given heretofore for this interval, but the measurements have been carefully checked by three parties and the results are in substantial agreement.

From a study of the isobathic lines it will be observed that the greatest intervals recorded between the Fort Scott limestone and the Boone chert are in a northeast-southwest line from Labette County, Kansas, to Rogers County, Oklahoma. The interval becomes smaller both to the east and to the west of this line.

In this connection it is interesting to note that the thickness of the limestone in the Fort Scott formation averages 20 to 40 feet on the outcrop and thickens rapidly westward to an average of 80 to 100 feet in northeastern Osage County, Oklahoma, and southeastern Chautauqua County, Kansas. Thence the formation thins to the west until it can scarcely be recognized in the well logs in west central Osage County, Oklahoma, and western Chautauqua, Elk, and Greenwood counties, Kansas. The alignment of greatest limestone thickness in the Fort Scott formation parallels the northeast-southwest alignment of greatest interval between the Boone chert and the Fort Scott formation.

The greater thickness of the Cherokee shale along the line from Labette County, Kansas, to Rogers County, Oklahoma, as shown by the isobathic lines, is interpreted as indicating the deeper part of the depositional basin in which the Cherokee was deposited. The lowest beds in this portion of the basin do not appear to have been deposited in the areas to the east and west, which were probably either land or covered intermittently by shallow water. It is only in this deeper part of the basin that we have the thick, lenticular sands, such as the Bartlesville, Burgess, and Tucker, which are so productive of oil and gas, in northeastern Oklahoma and southeastern Kansas. These sands are present in the lower one-third of the Cherokee formation and are practically confined to the area inclosed within the 400-foot isobathic line.[1] The sands higher in the section extend farther to the west. The lenticular nature of the sands in the lower part of the formation indicates an oscillating sea, and the occurrence of the greatest limestone thickness of the Fort Scott formation, to the west of the deepest part of the Cherokee basin, indicates a shifting of the basin in that direction as the Cherokee time interval progressed.

Irregularities appear in the isobathic lines, as in northern Chautauqua County, Kansas, for example. These irregularities appear to be due to the presence of troughs during the early history of the basin. These troughs may have been caused by erosion of the Boone chert before the deposition of the Cherokee shales or may have been formed by downwarping during the deposition. The trough mentioned is shown as a flat on the Boone chert contour map of the Kansas Geological Survey.[2]

Many smaller irregularities appear on the southwestern side of the basin, indicating that the surface of the Boone chert was considerably eroded by the time the Pennsylvanian sea encroached upon the land to the west. This is well shown by the isobathic lines in Washington and Osage counties, Oklahoma. In several places the presence of old river valleys may be indicated by the successive curving in of the isobathic lines, such as the one extending from the north edge of T. 23 N., R. 12 E. to T. 25 N., R. 10 E., Osage County, Oklahoma.

The writer is indebted to Mr. A. W. McCoy, under whose direction the work has been carried on, and also to Dr. L. C. Snider, for valuable suggestions.

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[1] The productive sands in the fields farther west, which have generally been correlated with the Bartlesville sand, are considered from our studies to be at other horizons.

[2] *State Geol. Surv. of Kansas, Bulletin No. 3*, p. 197.